

CLAIMS

What is claimed is:

1. A DC/DC converter comprising:
 - two charge pump circuits each of which converts a DC input voltage into a given DC output voltage; and
 - two driving circuits driving the two charge pump circuits respectively, wherein in a first mode, the two driving circuits complementarily drive the two charge pump circuits respectively, and the given output voltage is output from each of the two charge pump circuits, and
 - wherein in a second mode, one of the two driving circuits drives one of the two charge pump circuits, and the given output voltage is output from one of the two charge pump circuits and is not output from the other one of the two charge pump circuits.
 2. The DC/DC converter as defined in claim 1, wherein the other one of the two charge pump circuits stops an operation thereof in the second mode.
 3. The DC/DC converter as defined in claim 1, comprising a control input terminal in which a signal indicating the second mode is input.
 4. The DC/DC converter as defined in claim 1, wherein the first mode is set when a load connected to each of the two charge pump circuits is large, and the second mode is set when the load is small.
 5. The DC/DC converter as defined in claim 1, wherein the first mode is set when the DC input voltage is low, and the second mode is set when the DC input voltage is high.

6. The DC/DC converter as defined in claim 1, wherein the first mode is set when the DC output voltage is low, and the second mode is set when the DC output voltage is high.

7. A DC/DC converter comprising:

a charge pump circuit which converts a DC input voltage into a given DC output voltage;

a driving circuit which drives the charge pump circuit;

an oscillation circuit which supplies an oscillation output to the driving circuit,

wherein the oscillation circuit varies a frequency of the oscillation output according to an operation mode.

8. The DC/DC converter as defined in claim 7, wherein the oscillation circuit sets a frequency of the oscillation output higher in a first mode, and sets a frequency of the oscillation output lower in a second mode.

9. The DC/DC converter as defined in claim 8, comprising a control input terminal in which a signal indicating the second mode is input.

10. The DC/DC converter as defined in claim 8, wherein the first mode is set when a load connected to the charge pump circuit is large, and the second mode is set when the load is small.

11. The DC/DC converter as defined in claim 8, wherein the first mode is set when the DC input voltage is low, and the second mode is set when the DC input voltage is high.

12. The DC/DC converter as defined in claim 8, wherein the first mode is set when the DC output voltage is low, and the second mode is set when the DC output voltage is high.

13. A DC/DC converter comprising:

a charge pump circuit which converts a DC input voltage into a given DC output voltage;

a driving circuit which drives the charge pump circuit;

an oscillation circuit which supplies an oscillation output to the driving circuit,

wherein the charge pump circuit comprises:

a first switching circuit which includes a first transistor;

a second switching circuit which includes a second transistor having a smaller capability than the first transistor; and

a capacitor which is capable of changing a connecting condition by the first and second switching circuits,

wherein the driving circuit uses the first switching circuit to drive the charge pump circuit in a first mode, and uses the second switching circuit to drive the charge pump circuit in a second mode.

14. The DC/DC converter as defined in claim 13, comprising
a control input terminal in which a signal indicating the second mode is input.

15. The DC/DC converter as defined in claim 13, wherein the first mode is set when a load connected to the charge pump circuit is large, and the second mode is set when the load is small.

16. The DC/DC converter as defined in claim 13, wherein the first mode is set when the DC input voltage is low, and the second mode is set when the DC input voltage is high.

17. The DC/DC converter as defined in claim 13, wherein the first mode is set when the DC output voltage is low, and the second mode is set when the DC output voltage is high.

18. A power supply apparatus for a liquid crystal device, comprising:

- a first-stage charge pump circuit which converts a DC input voltage into a given DC output voltage;
- a first-stage driving circuit which drives the first-stage charge pump circuit;
- a series regulator which receives a DC output voltage of the first-stage charge pump circuit as an input voltage, and monitors an output voltage of the series regulator to output a constant voltage;
- a second-stage charge pump circuit which steps up the output voltage of the series regulator by a given number of times;
- a second-stage driving circuit which drives the second-stage charge pump circuit;
- an oscillation circuit which oscillates at a given frequency;
- a selection circuit which selects one of an oscillation output from the oscillation circuit and a display signal to be used for displaying on a display apparatus according to a selection signal; and
- a timing signal generation circuit which generates a given timing signal to be supplied to each of the first-stage driving circuit and the second-stage driving circuit based on a signal that is selected by the selection circuit.

19. The power supply apparatus for a liquid crystal device as defined in claim 18, wherein the display signal is a display scanning signal that is used for displaying on a liquid crystal display device.

20. The power supply apparatus for a liquid crystal device as defined in claim 18, comprising an input terminal in which the display signal and the selection signal are input.

21. The power supply apparatus for a liquid crystal device as defined in claim 18, wherein the selection circuit selects an oscillation output of the oscillation circuit when a load connected to the second-stage charge pump circuit is large, and selects the display signal when the load is small.

22. The power supply apparatus for a liquid crystal device as defined in claim 18, wherein the selection circuit selects an oscillation output of the oscillation circuit when the DC input voltage is low, and selects the display signal when the DC input voltage is high.

23. The power supply apparatus for a liquid crystal device as defined in claim 18, wherein the selection circuit selects an oscillation output of the oscillation circuit when an output voltage of any one of the first-stage charge pump circuit, the series regulator, and the second-stage charge pump circuit is low, and selects the display signal when the output voltage of any one of the first-stage charge pump circuit, the series regulator, and the second-stage charge pump circuit is high.